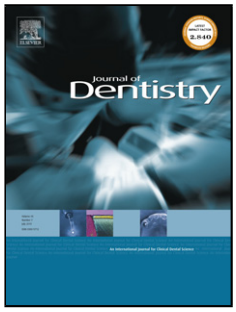


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# TOOTH WEAR AND QUALITY OF LIFE AMONG ADULTS IN THE UNITED KINGDOM

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**ABSTRACT**

**Objective:** To explore the association between tooth wear and quality of life among adults in the United Kingdom, independently of sociodemographic factors and other common oral conditions.

**Methods:** We used data from 5,654 dentate adults who participated in the 2009 Adult Dental Health Survey. Tooth wear was assessed during clinical examination and classified as none, mild, moderate and severe based on the worst affected tooth recorded. The numbers of teeth with mild, moderate and severe tooth wear were used as alternative measures. Oral impacts on quality of life were measured using the short form of the Oral Health Impact Profile (OHIP-14). The associations between tooth wear measures and OHIP-14 total and domain scores were tested in negative binomial regression models adjusting for sociodemographic and clinical factors.

**Results:** Overall, 62% of participants had mild, 13% moderate and 2% severe tooth wear. Adults with severe tooth wear had a crude OHIP-14 total score higher than those without tooth wear (Rate Ratio: 1.90; 95% Confidence Interval: 1.32-2.75). This association was attenuated after adjustment for confounders, particularly for other oral conditions (1.25; 95%CI: 0.90-1.73). Moreover, adults with severe tooth wear reported higher OHIP-14 domain scores in psychological discomfort (1.15; 95%CI: 1.06-1.25) and psychological disability (1.18; 95%CI: 1.10-1.30) than those without such condition. There was also evidence of a dose-response relationship; with higher OHIP-14 domain scores according to the number of teeth with severe tooth wear.

**Conclusion:** This nationwide study among UK adults shows that severe tooth wear was negatively associated with psychological impacts on people's life.

**Clinical significance:** Dentist should consider not only the patients' clinical characteristics, but also their impacts on quality of life and provide preventive or restorative management accordingly.

## INTRODUCTION

Tooth wear is the loss of dental hard tissues resulting of the interaction between teeth and other materials (abrasion), tooth-to-tooth contact (attrition) or dissolution of hard tissues by acidic substances (erosion) [1, 2]. Tooth wear is a relatively common condition [3-5] and its prevalence increases with age [3, 6]. Patients with a worn dentition often complain of tooth sensitivity associated with dentine exposure; dental pain due to involvement of the pulp; poor aesthetics owing to shortened clinical crown and loss of vertical dimension; and/or functional impairment for difficulties with chewing due to occlusal alterations and dental tissue loss [7-9]. Despite this knowledge, only few studies have formally assessed the impact of tooth wear on people's quality of life.

The first of those studies compared 76 tooth wear patients (classified as mild, 42 as moderate and 32 as severe according to the Smith and Knight index) with 76 controls matched by age, sex and education. Total satisfaction and domain scores (appearance, pain, oral comfort, general performance and eating capacity) in the Dental Impact on Daily Living questionnaire were significantly lower in tooth wear patients than controls [10]. In the second study, a convenience sample of 1010 university students were clinically examined using the Smith and Knight index and completed the Oral Health Impact Profile (OHIP-49). No differences in OHIP-49 total scores were found between participants with none/mild, moderate and severe tooth wear. However, the group with severe tooth wear had a higher domain score in functional limitation than the other two groups. Only bivariate results were reported [11]. In the most recent study, 51 adult patients with visible wear (dentin exposure and at least one third of loss of clinical crown height in three or more sextants) were compared with 58 healthy controls. Tooth wear patients had significantly higher total and domain scores in the Dutch version of the OHIP-49 than healthy controls. However, only unadjusted scores were presented [12]. In all, previous studies were based on patients or convenience samples, which precludes any generalisation to the wider population. In addition, they did not control for potential covariates. As sociodemographic factors are closely related to both tooth wear [3, 4, 13] and quality of life [14-16], they may confound the association between tooth wear and quality of life.

All previous studies used generic oral health-related quality of life (OHRQoL) measures, which not only captured the impacts caused by tooth wear but also those related to other oral conditions [17-20]. As many people with tooth wear may also have dental caries, tooth loss or even wear partial dentures, not considering the impact of the latter conditions can seriously affect the estimates of the

association between tooth wear and quality of life. Therefore, the problem arises not because of using a generic OHRQoL measure *per se* but because of failing to recognise that other conditions occurring simultaneously in the mouth also explain variations in the levels of the OHRQoL measure [21]. Population-based studies controlling for multiple oral conditions are therefore required to address the above mentioned limitations. The aim of this study was to investigate the association between tooth wear and oral impacts on quality of life among adults in the UK, independently of sociodemographic factors and other common oral conditions.

## MATERIALS AND METHODS

### Data source

Data are from the 2009 Adult Dental Health Survey. This national survey was based on a representative sample of adults, aged 16 and over, living in England, Wales and Northern Ireland. The sample size for the survey was 13,400 households, including 1150 in each English Strategic Health Authority and Wales, and 750 households in Northern Ireland. Participants were selected using a two-stage cluster sampling comprising of 268 primary sampling units (PSU) across the UK. Each PSU included two postcode sectors with 25 addresses sampled from each. A total of 13509 adults were invited to participate in the home interview and 11380 (84%) agreed. Of them, 813 (7%) were not eligible for the examination because they were edentate. From the remaining 10567 eligible respondents, a total of 6469 (61%) individuals were clinically examined [22].

### Variables selection

OHRQoL was measured using the short-form Oral Health Impact Profile (OHIP-14), which contains 14 questions on the frequency of adverse impacts caused by oral conditions during the preceding 12 months. OHIP-14 items are grouped into 7 dimensions: functional limitation (trouble pronouncing words and worsened taste), physical pain (aching in mouth and discomfort eating foods), psychological discomfort (feeling self-conscious and feeling tense), physical disability (interrupted meals and unsatisfactory diet), psychological disability (difficulty relaxing and embarrassment), social disability (irritability and difficulty in doing usual jobs) and handicap (life less satisfying and inability to function). The response to each question was coded from 0 to 4 (never, hardly ever, occasionally, fairly often and very often). Domain scores were calculated as the sum of responses to the two

corresponding items (ranging from 0 to 8) and the total score as the sum of responses to all 14 times (ranging from 0 to 56). Higher scores indicated worse OHRQoL [23].

An assessment of tooth wear was included during clinical examinations, which were conducted with participants seated on a chair and using artificial light, a mirror and a CPITN-C probe. Only anterior teeth were included in the tooth wear assessment. Tooth wear was assessed at three surfaces (buccal, incisal and lingual) per tooth and recorded as restricted to enamel, enamel loss just exposing dentine, more extensive dentine exposure (more than one-third of the buccal or palatal surface) or loss of dentine (exposed dentine facets with a bucco-lingual dimension 2mm or greater at the widest point in incisal surface), and complete enamel loss with exposure of dental pulp or secondary dentine [22, 24]. Tooth wear was classified as no, mild, moderate or severe based on the worst affected tooth recorded per participant. We also estimated the numbers of teeth with mild, moderate and severe tooth wear.

A number of sociodemographic and clinical factors were included as potential covariates. Participants provided information on their demographic (sex, age and country of residence), socioeconomic position (education and household income) and use of prosthesis. Education was assessed as the highest level of qualification received (no qualifications, below degree level and degree level and above). Weekly household income, from all sources and before deductions, was derived from responses to several questions. Clinical factors included the number of teeth, denture use, dental caries and periodontal disease, which were obtained through clinical examinations [22]. Dental caries was recorded at the surface level using the caries into dentine threshold (cavitated lesion) and defined as having one or more teeth with untreated decay [25]. The periodontal examination included the assessment of pocket depth at two sites (mesial and distal) on each tooth (buccally on upper arch and lingually on lower arch). The worst score in each sextant was recorded. Periodontal disease was defined as having one or more sextants with pocketing >4mm [25].

**Statistical analysis**

All analyses were weighted to take account of the survey design and possible non-response bias [22]. Negative binomial regression models were fitted as the OHIP-14 total and domain scores were count variables with over-dispersion [26]. Rate ratio (RR) with 95% confidence intervals (CI) were thus

reported. As for covariates, age and number of teeth were analysed in their continuous forms whereas household income was divided into quintiles.

The association between the severity of tooth wear and the OHIP-14 score was assessed in unadjusted, partially and fully adjusted models (labelled as Models 1, 2 and 3, respectively). Partially adjusted models controlled for sociodemographic factors (sex, age, country of residence, education and income) whereas the fully adjusted model additionally controlled for clinical factors (number of teeth, partial denture use, dental caries and periodontal disease). Therefore, the fully adjusted model provided an assessment of the association between severity of tooth wear and OHIP-14 scores independent of other oral conditions occurring simultaneously.

Furthermore, the associations of the numbers of teeth with mild, moderate and severe tooth wear with OHIP-14 scores were assessed in unadjusted, partially and fully adjusted models, as described above. The fully adjusted model included the numbers of teeth with mild, moderate and severe tooth wear simultaneously as explanatory variables in the model in addition to other clinical factors.

**RESULTS**

There were 5,654 dentate adults in the study sample, representing 87.4% of the full sample of dentate participants (n=6,469). The characteristics of the study sample are shown in Table 1. No major differences in demographic, socioeconomic and clinical factors were found between the study sample and those excluded because of missing values. Overall, 23.4% of the sample did not have any sign of tooth wear, whereas 61.7% had mild, 13.3% had moderate and 1.6% had severe tooth wear. The mean numbers of teeth with mild, moderate and severe tooth wear per participant were 4.5 (Standard Deviation: 2.9), 0.5 (SD: 1.1) and 0.04 (SD: 0.3), respectively.

The association between severity of tooth wear and OHIP-14 scores is shown in Table 2. Adults with severe tooth wear had a crude OHIP-14 total score higher than that of those without tooth wear (RR: 1.90; 95% CI: 1.32-2.75). This association was attenuated but remained significant after adjustment for sociodemographic factors (RR: 1.82; 95% CI: 1.26-2.57). However, the association was fully attenuated after adjustments for clinical factors (RR: 1.25; 95% CI: 0.90-1.73). Although the crude association with OHIP-14 was significant for 5 domains, psychological discomfort and psychological disability remained significantly related to OHIP-14 after adjustments for all covariates. Adults with

severe tooth wear had 1.47 (95% CI: 1.02-2.11) and 1.65 (95% CI: 1.05-2.60) times greater scores in psychological discomfort and psychological disability than those without tooth wear.

Similar results were found when using the number of teeth with different degrees of tooth wear as an alternative measure of exposure (Table 3). Only the number of teeth with severe tooth wear was significantly associated with OHIP-14 total score and this association remained significant before adjustments for clinical factors. In addition, the number of teeth with severe tooth wear was significantly associated with OHIP-14 domains scores on psychological discomfort and psychological disability, even after adjustment for all confounders. The OHIP-14 domain score for psychological discomfort and psychological disability increased 1.15 (95%CI: 1.06-1.25) and 1.18 (95%CI: 1.06-1.30) times per unit increase in the number of teeth with severe tooth wear.

**DISCUSSION**

This study shows that severe tooth wear may have an impact on people's quality of life, especially in relation to the domains of psychological discomfort and psychological disability. Moderate and mild tooth wear did not show any impact on quality of life. These results were robust to adjustments for socio-demographic factors, but more importantly, for clinical characteristics of participants.

Some limitations of this study need to be addressed. First, our findings were based on cross-sectional data, and as such, unable to test for causal relationships. Second, data were collected 7 years ago and not purposely to test our hypothesis. Despite being conducted in 2009, the Adult Dental Health Survey still remains the latest oral health survey available and the contemporary reference in the UK. More importantly, it provided us with an opportunity to explore the impact of tooth wear on quality of life at national level, a significant advantage compared to previous studies. Third, our study sample represented 87% of the total number of participating dentate adults, which may raise some concerns about its representativeness and the impact of missing data. However, we found no socio-demographic and clinical differences between the study sample and those excluded because of missing values, suggesting that our study sample was representative and the findings generalizable to the study population. Fourth, the assessment of tooth wear was based on partial-mouth recording (all anterior teeth), which may not be seen as valid as full-mouth recording [27, 28]. However, there is evidence that few wear cases are missed and all the most extensive and severe cases of coronal wear are classified as having some wear when all 12 anterior teeth are used as the index teeth [29].

That said, our findings await corroboration from new studies using alternative epidemiological indices of tooth wear, such as the Basic Erosive Wear Examination (BEWE) [30].

Not all levels of tooth wear were associated with impacts on quality of life in this study. Mild and moderate tooth wear had little impact on quality of life whereas adults with severe tooth wear have a relatively poorer quality of life than those without tooth wear. We did not find differences between the above two groups in the OHIP-14 total score, but only in two of the seven domains assessed with OHIP-14. It is possible that differences in the two significant domains were masked when they were combined with the scores for the five non-significant ones to generate the OHIP-14 total score. It is worth noting that the crude difference in OHIP-14 total score between those with severe tooth wear and without such condition was around 3 units. As the minimally important difference for the OHIP-14 has been set at 5 units [31], the above difference may not be regarded as clinically important. However, larger differences have been found among patient samples [12].

Severe tooth wear affected specific domains of daily living, namely psychological discomfort and psychological disability. Questions in these domains relate to self-awareness, such as feeling self-conscious or tense (psychological discomfort) and difficulty relaxing or embarrassment (psychological disability). These feelings may have been triggered by poor appearance and dentin hypersensitivity, the two most common symptoms in tooth wear patients [8, 10] and the main motivation to seek dental care [32]. Functional problems and pain are not very common among adults with tooth wear, even in severe cases [8, 10]. What is clear though is that participants were more worried about the psychological than the physical (inadequate function) consequences of severe tooth wear, which could be explained to some extent by the fact that the assessment of tooth wear focused on anterior teeth where aesthetics plays a major role in everyday activities and social interaction.

We also found evidence of a dose-response association between severe tooth wear and quality of life. There were gradual deteriorations in quality of life scores as the numbers of teeth with severe tooth wear increased. This finding is important since the count was restricted to anterior teeth, suggesting that not only those with generalised severe tooth wear, but also those with localised forms of the condition had poorer quality of life than those with no signs of the condition.

The present findings have some implications for practice and research. Dentist should consider not only the patients' clinical characteristics, but also their impacts on quality of life and provide preventive

or restorative management accordingly. OHRQoL measures have the potential to provide insights into how oral conditions affect aspects of everyday life that are important to patients and individuals [33, 34]. As such, they can complement traditional or professionally determined outcome measures for the assessment of tooth wear and prioritisation of care to those who need it most [35]. Providing treatment to those who are not aware or do not care about their dental appearance, and denying treatment to those who are psychosocially affected by severe tooth wear is a waste of valuable limited manpower resources. As tooth wear can be a result of erosion, abrasion or attrition, further studies could explore the impact each one of these clinical entities has on quality of life. This may help identifying the factors with the most impact on people's life. In addition, alternative OHRQoL measures, especially one that is specific to the condition or its main symptoms (aesthetics and hypersensitivity), may be more responsive to smaller changes in quality of life due to tooth wear.

In conclusion, this study provides some support for the impact of tooth wear on quality of life among adults in the UK. Adults with severe tooth wear reported more frequent impacts on the psychological discomfort and psychological disability domains than those without tooth wear. Mild and moderate tooth wear were not associated with oral impacts on quality of life.

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**Table 1.** Characteristics of the study sample (n=5654) and comparison with full sample of dentate adults (n=6469)

| Explanatory Variables | All dentate adults | | Study sample | |
|---|---|---|---|---|
| | n[a] (%) or Mean + SD | | n[a] (%) or Mean + SD | |
| *Sex* | | | | |
| Men | 2961 | (49.1) | 2591 | (49.1) |
| Women | 3508 | (50.9) | 3063 | (50.9) |
| *Age groups* | | | | |
| 16 to 24 years | 645 | (15.7) | 589 | (16.2) |
| 25 to 34 years | 910 | (16.5) | 847 | (17.4) |
| 35 to 44 years | 1282 | (19.8) | 1178 | (20.8) |
| 45 to 54 years | 1199 | (16.8) | 1070 | (17.2) |
| 55 to 64 years | 1156 | (15.0) | 983 | (14.5) |
| 65 to 74 years | 805 | (9.6) | 641 | (8.6) |
| 75 + years | 472 | (6.6) | 346 | (5.3) |
| *Education* | | | | |
| No Education | 992 | (14.4) | 833 | (13.7) |
| Below degree level | 3830 | (59.6) | 3336 | (59.6) |
| At degree level or above | 1641 | (26.0) | 1486 | (26.7) |
| *Income* | | | | |
| 1st quintile (lowest) | 926 | (14.2) | 911 | (16.0) |
| 2nd | 1336 | (20.1) | 1329 | (22.8) |
| 3rd | 1008 | (15.1) | 1000 | (17.1) |
| 4th | 1061 | (16.3) | 1059 | (18.6) |
| 5th quintile (highest) | 1358 | (22.3) | 1355 | (25.5) |
| *Country of residence* | | | | |
| England | 5622 | (91.8) | 4897 | (91.60) |
| Wales | 415 | (5.2) | 374 | (5.30) |
| Northern Ireland | 432 | (3.0) | 383 | (3.10) |
| *Number of teeth* | 25.7 + 4.3 | | 25.9 + 4.1 | |
| *Use of dentures* | | | | |
| No | 5455 | (86.6) | 4824 | (87.8) |
| Yes | 1013 | (13.4) | 830 | (12.2) |
| *Dental caries*[b] | | | | |
| No | 3901 | (60.9) | 3385 | (60.0) |
| Yes | 2568 | (39.1) | 2269 | (40.0) |
| *Periodontal disease*[b] | | | | |
| No | 3425 | (54.8) | 3031 | (55.5) |
| Yes | 3025 | (45.0) | 2623 | (44.5) |
| *Severity of tooth wear* | | | | |
| None | 1307 | (22.8) | 1161 | (23.4) |
| Mild | 4103 | (61.7) | 3584 | (61.7) |
| Moderate | 934 | (13.8) | 807 | (13.3) |
| Severe | 125 | (1.7) | 102 | (1.6) |
| *Teeth with mild tooth wear* | 4.5 + 2.9 | | 4.5 + 2.9 | |
| *Teeth with moderate tooth wear* | 0.5 + 1.1 | | 0.5 + 1.1 | |
| *Teeth with severe tooth wear* | 0.04 + 0.3 | | 0.04 + 0.3 | |

SD: Standard deviation
[a] Counts are unweighted
[b] Dental caries was defined as having one or more teeth with untreated decay. Periodontal disease was defined as having one or more sextants with pocketing>4mm

**Table 2.** Association between severity of tooth wear and OHIP-14 scores

| OHIP-14 score | Tooth wear | Mean (SD) | Model 1[a] | Model 2 | Model 3 |
|---|---|---|---|---|---|
| | | | RR[b] [95% CI] | RR [95% CI] | RR [95% CI] |
| *Total score* | None | 3.57 (4.63) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *(0-56)* | Mild | 3.80 (4.92) | 1.06 [0.93-1.22] | 1.04 [0.90-1.19] | 1.02 [0.89-1.18] |
| | Moderate | 3.83 (4.86) | 1.07 [0.90-1.28] | 1.04 [0.86-1.24] | 0.93 [0.78-1.11] |
| | Severe | 6.79 (8.09) | 1.90 [1.32-2.75]** | 1.80 [1.26-2.57]** | 1.25 [0.90-1.73] |
| *Functional* | None | 0.22 (0.55) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *limitation* | Mild | 0.22 (0.63) | 1.02 [0.78-1.34] | 0.86 [0.64-1.15] | 0.81 [0.60-1.09] |
| *(0-8)* | Moderate | 0.29 (0.73) | 1.36 [0.97-1.90] | 0.96 [0.67-1.38] | 0.71 [0.47-1.08] |
| | Severe | 0.50 (0.89) | 2.32 [1.39-3.87]** | 1.67 [0.96-2.89] | 0.89 [0.48-1.64] |
| *Physical* | None | 1.21 (1.27) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *discomfort* | Mild | 1.34 (1.42) | 1.11 [0.99-1.24] | 1.09 [0.97-1.23] | 1.07 [0.95-1.21] |
| *(0-8)* | Moderate | 1.30 (1.41) | 1.08 [0.93-1.24] | 1.06 [0.91-1.24] | 0.99 [0.85-1.16] |
| | Severe | 1.75 (1.69) | 1.45 [1.08-1.94]* | 1.41 [1.06-1.88]* | 1.14 [0.86-1.50] |
| *Psychological* | None | 0.79 (1.17) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *discomfort* | Mild | 0.85 (1.30) | 1.07 [0.92-1.25] | 1.02 [0.86-1.21] | 1.01 [0.85-1.20] |
| *(0-8)* | Moderate | 0.90 (1.35) | 1.13 [0.92-1.38] | 1.08 [0.87-1.34] | 0.97 [0.78-1.20] |
| | Severe | 1.61 (1.80) | 2.02 [1.43-2.87]*** | 2.02 [1.40-2.93]*** | 1.47 [1.02-2.11]* |
| *Physical* | None | 0.33 (0.74) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *disability* | Mild | 0.31 (0.72) | 0.95 [0.75-1.21] | 0.90 [0.69-1.16] | 0.91 [0.70-1.20] |
| *(0-8)* | Moderate | 0.33 (0.83) | 1.01 [0.74-1.39] | 0.87 [0.62-1.23] | 0.74 [0.52-1.06] |
| | Severe | 0.66 (1.16) | 2.02 [1.23-3.32]** | 1.75 [1.02-3.01]* | 1.09 [0.64-1.85] |
| *Psychological* | None | 0.55 (0.92) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| disability | Mild | 0.59 (1.02) | 1.08 [0.91-1.29] | 1.12 [0.93-1.36] | 1.10 [0.91-1.34] |
| *(0-8)* | Moderate | 0.57 (1.05) | 1.05 [0.82-1.33] | 1.14 [0.89-1.48] | 1.04 [0.79-1.35] |
| | Severe | 1.12 (1.54) | 2.05 [1.33-3.18]** | 2.34 [1.48-3.69]*** | 1.65 [1.05-2.60]* |
| *Social* | None | 0.26 (0.62) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *disability* | Mild | 0.26 (0.66) | 1.00 [0.78-1.29] | 1.05 [0.80-1.37] | 1.01 [0.77-1.31] |
| *(0-8)* | Moderate | 0.21 (0.59) | 0.83 [0.59-1.16] | 0.93 [0.65-1.32] | 0.79 [0.55-1.14] |
| | Severe | 0.47 (1.06) | 1.81 [0.91-3.62] | 2.12 [1.08-4.15]* | 1.23 [0.63-2.40] |
| *Handicap* | None | 0.21 (0.59) | 1.00 [Reference] | 1.00 [Reference] | 1.00 [Reference] |
| *(0-8)* | Mild | 0.22 (0.60) | 1.02 [0.76-1.37] | 0.92 [0.68-1.25] | 0.97 [0.71-1.33] |
| | Moderate | 0.22 (0.58) | 1.04 [0.72-1.49] | 0.87 [0.60-1.28] | 0.81 [0.54-1.21] |
| | Severe | 0.67 (1.37) | 3.16 [1.58-6.31]** | 2.39 [1.26-4.57]** | 1.45 [0.77-2.75] |

[a] Model 1 was unadjusted; Model 2 was adjusted for sociodemographic factors (sex, age, country, education and income); and Model 3 was also adjusted for other clinical variables (number of teeth, prosthesis, any decay teeth and any pocketing>4mm)
[b] Negative binomial regression was fitted and rate ratios (RR) reported.
* p<0.05, ** p<0.01, *** p<0.001

**Table 3.** Association of the number of teeth with different levels of tooth wear and OHIP-14 scores

| OHIP-14 score | Number of teeth affected | Model 1[a] | Model 2 | Model 3 |
|---|---|---|---|---|
| | | RR[b] [95% CI] | RR [95% CI] | RR [95% CI] |
| *Total score* | Mild tooth wear | 1.00 [0.98-1.01] | 0.99 [0.97-1.00] | 1.00 [0.98-1.01] |
| *(0-56)* | Moderate tooth wear | 1.01 [0.98-1.04] | 1.01 [0.98-1.04] | 0.99 [0.96-1.02] |
| | Severe tooth wear | 1.20 [1.03-1.39]* | 1.19 [1.04-1.37]* | 1.08 [0.99-1.18] |
| *Functional* | Mild tooth wear | 0.99 [0.97-1.02] | 0.97 [0.94-1.00] | 0.98 [0.95-1.01] |
| *limitation* | Moderate tooth wear | 1.07 [1.00-1.14] | 1.02 [0.96-1.10] | 0.96 [0.89-1.03] |
| *(0-8)* | Severe tooth wear | 1.33 [1.13-1.57]*** | 1.26 [1.05-1.51]* | 1.09 [0.91-1.31] |
| *Physical* | Mild tooth wear | 1.00 [0.99-1.01] | 1.00 [0.99-1.01] | 1.00 [0.99-1.01] |
| *Discomfort* | Moderate tooth wear | 1.01 [0.98-1.04] | 1.01 [0.98-1.04] | 1.00 [0.97-1.03] |
| *(0-8)* | Severe tooth wear | 1.04 [0.92-1.18] | 1.04 [0.92-1.18] | 0.98 [0.88-1.09] |
| *Psychological* | Mild tooth wear | 1.00 [0.98-1.01] | 0.98 [0.97-1.00] | 1.00 [0.98-1.01] |
| *Discomfort* | Moderate tooth wear | 1.01 [0.97-1.05] | 1.01 [0.97-1.05] | 0.98 [0.94-1.02] |
| *(0-8)* | Severe tooth wear | 1.21 [1.07-1.37]* | 1.24 [1.09-1.40]*** | 1.15 [1.06-1.25]*** |
| *Physical* | Mild tooth wear | 0.98 [0.96-1.01] | 0.97 [0.95-1.00] | 0.98 [0.96-1.01] |
| *Disability* | Moderate tooth wear | 1.03 [0.98-1.08] | 1.01 [0.96-1.07] | 0.98 [0.93-1.03] |
| *(0-8)* | Severe tooth wear | 1.24 [1.02-1.50]* | 1.21 [0.99-1.49] | 1.05 [0.88-1.24] |
| *Psychological* | Mild tooth wear | 0.99 [0.98-1.01] | 0.99 [0.97-1.01] | 1.00 [0.98-1.02] |
| *Disability* | Moderate tooth wear | 1.00 [0.95-1.05] | 1.01 [0.96-1.06] | 0.99 [0.94-1.04] |
| *(0-8)* | Severe tooth wear | 1.23 [1.06-1.43]** | 1.27 [1.10-1.47]** | 1.18 [1.06-1.30]** |
| *Social* | Mild tooth wear | 0.99 [0.97-1.02] | 0.99 [0.96-1.01] | 0.99 [0.97-1.02] |
| *disability* | Moderate tooth wear | 0.97 [0.91-1.04] | 0.99 [0.93-1.06] | 0.96 [0.90-1.04] |
| *(0-8)* | Severe tooth wear | 1.22 [0.93-1.59] | 1.29 [1.00-1.66] | 1.11 [0.90-1.36] |
| *Handicap* | Mild tooth wear | 0.98 [0.95-1.01] | 0.97 [0.94-0.99] | 0.99 [0.96-1.02] |
| *(0-8)* | Moderate tooth wear | 0.98 [0.91-1.06] | 0.96 [0.90-1.04] | 0.93 [0.87-1.00] |
| | Severe tooth wear | 1.49 [1.00-2.22] | 1.34 [0.95-1.88] | 1.11 [0.88-1.39] |

[a] Model 1 was unadjusted; Model 2 was adjusted for sociodemographic factors (sex, age, country, education and income); and Model 3 was also adjusted for other clinical variables (number of teeth and prosthesis, untreated decay, pocketing>4mm and the other two indicators of tooth wear)
[b] Negative binomial regression was fitted and rate ratios (RR) reported.
* p<0.05, ** p<0.01, *** p<0.001